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NOTES ON LARVAE OF NINE GENERA OF APHODIINAE IN THE UNITED STATES (COLEOPTERA : SCARABAEIDAE)

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The coprophagus scarabaeid subfamily Aphodiinae contains a great many species of small to medium-sized beetles with a great diversity of habits. Most species are found in dung; some, however, are found in soil or sand feeding on organic matter or roots of living plants; others are said to be parasitic. The subfamily is worldwide in distribution.

This study of the systematics of larval Aphodiinae, begun in November 1954, was undertaken because practically nothing was known of the American genera and species. It was suggested by Dr. Paul O. Ritcher, Department of Entomology, Oregon State College, Corvallis, Oreg., and is based on the study of larvae and adults loaned from the U.S. National Museum (USNM), Dr. Ritcher's personal collection (POR) and material collected by the writer. The assistance and encouragement of Mr. O. L. Cartwright of the U.S. National Museum are gratefully acknowledged.

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Keys based on morphological differences of the known larvae of Aphodiinae of the United States are presented for separating tribes, genera, and species. Morphological differences of the epipharynges, maxillae, rasters, and lower anal lobes are used. Before the present study was undertaken, unnamed larvae of the Aphodiinae could not be assigned below the subfamily level. Now, for the first time, adequate keys permit separation of the four tribes and of 9 of the 15 genera found in the United States.

Larvae of four genera—*Aegialia*, *Aphotaenius*, *Euparia*, and *Pleurophorus*—are described for the first time from reared material and are included with *Aphodius*, *Oxyomus*, *Saprosites*, *Ataenius*, and *Psammodius* in the present study.

It is unfortunate that reared material of the remaining genera and of more species of the included genera was not available for study. Relatively extremely little reared material has been accumulated by any individual or institution. Every available known larva was examined.

Larvae of six genera of Aphodiinae from the United States are yet to be recognized and described. Larvae of *Dialytes*, *Dialytellus*, *Pseudataenius*, *Rhyssemus*, *Trichiorhyssemus*, and *Microaegialia* are unknown.

The larvae of *Aegialia* show close similarities with the larvae of Aphodiinae and in this work have been treated under the subfamily Aphodiinae in a new tribe. On the basis of larval characters the tribes of Aphodiinae can be arranged in the following order: Aegialiini, Aphodiini, Eupariini, and Psammodiini.

Review of Literature

The earliest paper on the larvae of Aphodiinae appeared in 1835, when De Hann (1835) described and discussed briefly the systematic position of *Aphodius luridus* Fabricius and *A. conjugatus* Panzer larvae. Mulsant (1842) briefly characterized the larvae of *Aphodius distinctus* Müller, *A. satellitus* Herbst, and *A. varians* Duftschmid. In 1871 he characterized larvae of *Aphodius fimetarius* (Linnaeus).

Schiodte (1874) gave diagrams and distinguishing larval characters for *Aphodius rufipes* (Linnaeus), *A. granarius* (Linnaeus), *A. fossor* (Linnaeus), and *A. brevis* Erichson. Perris (1877) published brief descriptions of *Aphodius fossor* (Linnaeus) and *A. constans* Duftschmid. Rosenhaur (1882) described and gave a key for six species of the genus *Aphodius*, but he used the characters of color and width of head capsule, which are not reliable. Hansen (1925) gave distinguishing characters for larvae of the genus *Aphodius* and wrote short descriptions for eight species.

In 1928 Hayes described the epipharynx of *Aphodius* and in 1929 he partially described and compared larvae of Aphodinae (*Aphodius*) with other scarabaeid larvae. Böving and Craighead (1931) separated *Aphodius rufipes* and *Aphodius fossor* groups in their keys to families and subfamilies of Scarabaeoidea.

Gardner (1935) described the immature stages of Scarabaeoidea from India and gave pupal and larvae characters for the genus *Aphodius* and a key for five species of the genus *Aphodius*. According to him the pupae of *Aphodius* can be separated from other scarabaeid pupae by the presence of two filamentous caudal appendages.

Madle (1934) dealt with the morphology, ecology, and physiology of the larvae and adults of *Aphodius rufipes* Linnaeus. Also, Madle (1935, 1936) gave a key to 13 species of the genus *Aphodius* and a detailed account of each species. According to his observations, the 13 species could be separated into five distinct types on the basis of the lower anal lobe, shape of the setae on the raster, and structure of the head capsule.

Paulian and Villiers (1939) were the first to describe the larva of *Heptaulacus peyerimhoff* Paulian and Villiers found in humid turf soil in Morocco. They considered *Heptaulocus* larvae to be close to *Aphodius*, especially the *rufipes* group.

Korschefsky (1940) separated larvae of Aphodiinae (*Aphodius fimetarius* (Linnaeus) and *A. fossor* (Linnaeus)) from other scarabaeid larvae in his illustrated key to German scarabaeid larvae. Van Emden (1941) separated Aphodiinae from other subfamilies of scarabaeid larvae, presenting a key to 13 species of the genus *Aphodius* and separating larvae of the genus *Saprosites* (*S. mendax* Blackburn) and the genus *Oxyomus* (*O. silvestris* Scopoli) for the first time.

Schaerffenberg (1941) gave a key for separating Aphodiinae from other scarabaeid larvae. Paulian (1942, pp. 129–131) published a description of the larvae of *Rhyssemodes orientalis* Mulsant and Godart and compared larvae of the genus *Rhyssemodes* with the larvae of the genus *Aphodius* and the genus *Ataenius*.

Carne's (1950) publication on the morphology of immature stages of *Aphodius howitti* Hope from Australia was the first paper on *Aphodius* spp. to use Böving's and Ritcher's modern terminology for the raster and epipharynx.

Medvedev (1952) published an illustrated paper on the larvae of scarabaeid beetles of the fauna of the U.S.S.R. and separated *Aphodius*, *Psammodius*, and *Cnemisus*. He described *Psammodius sulcicollis* Illiger, *Cnemisus ahngeri* Seminov, and 14 species of the genus *Aphodius*.

In addition to the above literature, a great amount of work has been done on the other subfamilies of the Scarabaeidae which is

quite applicable to a study of Aphodiinae. Among these are notable and excellent papers by Böving (1936) on the explanation for terms applied to the epipharynx and raster, and by Ritcher (1945, 1947) on the larvae of Coprinae and Geotrupinae. In this paper, these works are referred to frequently and the same terminology is used.

Larval Taxonomy

The scarabaeid subfamily Aphodiinae, as shown by a detailed morphological study of the larvae, includes four tribes—Aegialiini, Aphodiini, Eupariini, and Psammodiini. Almost all scarabaeid larvae have stridulatory teeth on the maxillae. The larvae of *Psammodius* and *Pleurophorus* of the tribe Psammodiini and *Saprosites* of the tribe Eupariini lack stridulatory teeth.

Larvae of Aphodiinae may be characterized as follows: Antenna 4-segmented (in *Aphodius* first antennal segment apparently subdivided). Third antennal segment with an apical, conical sensory organ. Fourth antennal segment small and conical, with a sensory area, and bearing sensory pegs and a seta at its tip. Epipharynx usually weakly trilobed; haptomerum with two macrosensillae. Pedium bounded on all sides by nonarticulating processes. Tormae fused mesally and produced into an epitorma. Crepide present posterior to tormae. Scissorial area of right mandible with S_{1+2} and S_{3+4}. Maxilla with cardo, stipes, galea, lacinia, and 4-segmented maxillary palp; galea and lacinia separate but close together. Galea ventrally with a row of short setae; lacinia dorsally with a row of setae near the mesal edge. Legs 4-segmented, consisting of a coxa, trochanter, femur, and tibiotarsus, the latter bearing a simple claw; claw with two short setae near the middle. Spiracular concavities facing ventrally. Anal lobes whitish or yellowish white and without setae.

Larval key to tribes of the subfamily Aphodiinae found in the United States

1. Lower anal lobe either emarginate or entire 2
   Lower anal lobe divided into two sublobes either adjacent or remote 3
2. Lower anal lobe entire (fig. 86) . . . . . **Aegialiini**
   Lower anal lobe emarginate (fig. 85) . . . . . **Aphodiini**
3. Maxillary stridulatory area with teeth (fig. 49), except in the genus *Saprosites* where the lacinia lacks an apical uncus (fig. 46) . . . . . **Eupariini**
   Maxillary stridulatory area without teeth (fig. 50) . . . . . **Psammodiini**

Tribe Aegialiini

This tribe is represented in the United States by only two of the five known genera, *Aegialia* Latreille and *Microaegialia* Brown. So far, 19 species of the genus *Aegialia* have been recorded from the

United States. Species dealt with in this study include *Aegialia blanchardi* Horn and *Aegialia lacustris* LeConte.

This tribe has been treated by taxonomists as a separate subfamily, but study of the larvae proves beyond doubt that the subfamily Aegialiinae can be included under the subfamily Aphodiinae as a separate tribe.

Larvae of the genus *Aegialia* bear the following similarities with the larvae of other Aphodiinae:

1. Setae on the frons like those found in the tribe Aphodiini, genera *Ataenius* and *Euparia*.
2. Antenna 4-segmented, which is characteristic of the subfamily Aphodiinae (in *Aphodius*, the first antennal segment apparently subdivided). Third antennal segment apically with a sensory conical structure, fourth segment small and conical.
3. Clypeus, on either side, with three setae, as in the tribes Aphodiini and Psammodiini and the genera *Ataenius* and *Euparia* of the tribe Euparіini.
4. Epipharynx resembling that of the Aphodiinae in shape, position, number of setae, and in the presence of clithra and tormae.
5. Right mandible like that of other Aphodiinae.
6. Maxilla similar to that of the Aphodiinae.
7. Body and legs with the same segmentation and setal pattern as in the Aphodiinae.
8. Raster with teges similar to those in the Aphodiinae. Anal lobes whitish and without setae.

Genus *Aegialia* Latreille

Larvae of the genus *Aegialia* may be characterized as follows: Frons, on each side, with two short posterior frontal setae and a microsensilla, a long seta at each anterior angle, a long exterior frontal seta and a microsensilla, and a short anterior frontal seta and a microsensilla. Clypeus with three setae on each side. First, second, and third antennal segments subequal; third antennal segment with a conical sensory area.

Epipharynx with protophoba tristichous on the left and monostichous on the right; dexiophoba and laeophoba monostichous; mesophoba monostichous in the middle and bistichous on the sides. Tormae asymmetrical, dexiotorma produced cephalad and caudad, laeotorma slightly produced cephalad. Crepide subcircular with two microsensillae on it and two on either side of it.

Scissorial area of left mandible with S_1, S_2 and S_{3+4} and of right mandible with S_{1+2} and S_{3+4}. Each mandible dorsally with two or three setae and ventrally with two setae. Galea ventrally with a long seta and a row of four short setae. Palpifer distinct and with one to three conical teeth.

Abdominal segments 1–7 each with three dorsal annulets; each annulet with a transverse row of setae. Segments 8–10 each with

three dorsal rows of setae, but dorsa not subdivided into annulets. Each abdominal spiracle-bearing area with 6–8 setae ventrally and three or four setae dorsally.

Tegillar setae scattered irregularly on the venter of 10th abdominal segment. Anal lobes whitish, without setae; lower anal lobe entire.

Key to known larvae of *Aegialia* Latreille

1. Galea dorsally with five stout setae; raster with 48–58 hamate tegillar setae. **lacustris** LeConte

   Galea dorsally with four stout setae; raster with 25–37 hamate setae. **blanchardi** Horn

Aegialia lacustris LeConte

FIGURES 25, 86

MATERIAL EXAMINED: Seven third-stage larvae and cast skins of 10 third-stage larvae reared to the adult stage, being a part of 30 larvae collected in soil under willows along the roadside toward Adel, Oreg., May 17, 1957, by Paul O. Ritcher.

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.29–1.42 mm. Cranium yellowish white, surface smooth except for two small depressions on each side of the frons, five or six dorsoepicranial setae and three or four microsensillae on each side.

Epipharynx with 15–17 microsensillae along the base of the protophoba. Maxillary stridulatory area with an irregular row of 15–20 conical teeth. Galea dorsally with five stout setae. Lacinia dorsally with a row of six long setae near the mesal edge and a single seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with 12 short setae, each scutum with 4–6 long setae and 12–14 short setae on each side, and each scutellum with 16 short setae. Raster with teges of 48–58 hamate setae curved at their distal ends.

Aegialia blanchardi Horn

FIGURES 2, 39, 53, 70

MATERIAL EXAMINED: One third-stage larva, associated with adults, collected under grass roots in sand dunes at Waldport, Oreg., July 16, 1955, by Paul O. Ritcher and Manohar Jerath (adults determined by O. L. Cartwright); 20 third-stage larvae and the cast skins of 10 third-stage larvae reared to the adult stage, being part of a large number collected under grass roots in sand dunes at Waldport, Oreg., June 12, 1956, by Paul O. Ritcher and Manohar Jerath; and 4 third-stage larvae, associated with adults, collected under grass roots in sand dunes at Waldport, Oreg., May 29, 1957, by Manohar Jerath.

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.09×1.19 mm. Cranium light yellow, surface smooth except for three depressions in a line on each side on the frons, 6–8 dorsoepicranial setae and 3–5 microsensillae on each side.

Protophoba of epipharynx with 13-16 microsensillae. Maxillary stridulatory area with an irregular row of 12–16 conical teeth. Galea dorsally with four stout setae. Lacinia dorsally with a row of five or six long setae near the mesal edge and a seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with 12–14 short setae, each scutum with 6–8 long setae and 20–25 short setae on each side, and each scutellum with 16–18 short setae.

Raster with teges of 25–37 hamate setae curved at their distal ends.

Tribe APHODIINI

This tribe is represented in the United States by only three of the many known genera in the world. The genus *Oxyomus* Laporte occurs only in the Eastern States; the genus *Xerospsamobeus* Saylor is known only from California. In contrast, more than 100 species of the genus *Aphodius* Illiger occur in the United States.

Species dealt with in this study include *Oxyomus silvestris* (Scopoli), the only species of this genus known in the United States, and 19 species of the genus *Aphodius*. Two of these species of *Aphodius* are from Australia, where they are pests in pastures. Six specimens were reared by the author. The others were borrowed from the U.S. National Museum and the personal collection of Paul O. Ritcher.

Larvae of this tribe may be characterized as follows: Frons, on each side, with two short posterior frontal setae and a microsensilla, a long seta at each anterior angle, a single long exterior frontal seta and a microsensilla, and a single short anterior frontal seta and a microsensilla. Frontal sutures distinct. Clypeus marked into large sclerotized postclypeus and a small weakly sclerotized preclypeus; clypeus with three setae on each side. Maxillary stridulatory area with conical teeth; palpifer differentiated. Anal lobes whitish, without setae; lower anal lobe emarginate, partially divided into sublobes, never completely divided.

Larval key to *Oxyomus* and *Aphodius*

Left mandible with S_{1+2}, S_3 and S_4 (fig. 26); galea dorsally with four stout setae (fig. 40); 9th and 10th abdominal segments strongly tapering in a concave curve (fig. 79) . . . . . **Oxyomus** Laporte

Left mandible with S_{1+2} and S_3 (fig. 23); galea dorsally with five or more stout setae (fig. 41); 9th and 10th abdominal segment slightly tapering in a concave curve . . . . . **Aphodius** Illiger

***Oxyomus silvestris* (Scopoli)**

FIGURES 10, 13, 26, 40, 60, 71, 79

MATERIAL EXAMINED: Five third-stage larvae and two second-stage larvae collected in soil around roses at Luxemburg, May 24, 1949 (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.83–0.92 mm. Cranium light yellowish brown, smooth, two or three dorsoepicranial setae and two microsensillae on each side. Second and third antennal segments subequal, first longer than second or third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae. Laeophoba polystichous; dexiophoba monostichous; mesophoba monostichous in the middle and polystichous on the sides. Crepide subtriangular. Tormae asymmetrical, dexiotorma produced cephalad and caudad, laeotorma small and slightly produced caudad with end blunt.

Scissorial area of left mandible with S_{1+2}, S_3 and S_4, and of right mandible with S_{1+2} and S_{3+4}. Each mandible dorsally with two setae and ventrally with a single seta.

Maxillary stridulatory area with a row of seven conical teeth; palpifer with three teeth. Galea dorsally with four stout setae, ventrally with a long seta and a row of seven or eight short setae. Lacinia with terminal uncus of three ventral toothlike lobes, dorsally with a row of five long setae along the mesal edge and a short seta posteriorly.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with eight short setae. Segments 7–10 each with two transverse rows of setae but dorsa not subdivided into annulets. Segments 9 and 10 strongly tapering in a concave curve. Each abdominal spiracle-bearing area with two setae ventrally and a single seta dorsally.

Raster with two longitudinal palidia surrounded on sides by 9–14 tegillar setae. Each palidia with 7–9 caudomesally directed spinelike setae. Tegillar setae arranged in two rows, one on each side of palidia.

Genus *Aphodius* Illiger

Larvae of the genus *Aphodius* may be characterized as follows: Frons, on each side, with two short posterior frontal setae with a microsensilla (in *A. erraticus* two or three setae with two microsensillae), a short anterior frontal seta and a microsensilla, a long exterior

frontal seta and a microsensilla and a long seta at each anterior angle. First antennal segment apparently subdivided. Scissorial area of left mandible with S_{1+2} and S_3 and of right mandible with S_{1+2} and S_{3+4}. Each mandible dorsally with two or three setae and ventrally with three or four short setae. Galea dorsally with more than four setae. Abdominal segments 1–8 each with three dorsal annulets; segments 9 and 10 each with two rows of dorsal setae, dorsa not divided. Lower anal lobe emarginate, partially subdivided into two lobes (or into four as in *A. erraticus*).

Key to known larvae of *Aphodius* Illiger

1. Raster with palidia 2
   Raster without palidia 4
2. Dexiotorma produced caudad; lacinia dorsally with a row of five or six setae along the mesal edge and a short seta posteriorly; second and third antennal segments subequal, first long 3
   Dexiotorma not produced caudad; lacinia with a row of eight or nine long setae along the mesal edge and two short setae posteriorly; first and second antennal segments subequal, third short (Australian species). **pseudotasmaniae** Given, **howitti** Hope
3. Laeotorma produced caudad; abdominal segments 6–8 dorsally with three transverse rows of setae; galea ventrally with a row of six or seven short setae; lacinia dorsally with a row of six long setae along the mesal edge and a short seta posteriorly . . . . . **granarius** (Linnaeus)
   Laeotorma not produced caudad; abdominal segments 6–8 dorsally with two transverse rows of setae; galea ventrally with a row of 11 or 12 short setae; lacinia dorsally with a row of five long setae along the mesal edge and a short seta posteriorly . . . . . **pardalis** LeConte
4. Maxilla with stridulatory teeth on palpifer 5
   Maxilla without stridulatory teeth on palpifer 12
5. Epipharynx with laeotorma not produced caudad 6
   Epipharynx with laeotorma produced caudad 8
6. Palpifer with three or fewer stridulatory teeth; galea ventrally with 17 or fewer short setae in a row; lacinia dorsally with six or fewer long setae in a row near the mesal edge and a short seta posteriorly; raster with less than 91 tegillar setae; each abdominal spiracle-bearing area with two setae dorsally and two setae ventrally 7
   Palpifer with more than three stridulatory teeth; galea ventrally with 18–22 short setae in a row; lacinia dorsally with a row of nine long setae near the mesal edge and a short seta posteriorly; raster with 130–165 short tegillar setae; each abdominal spiracle-bearing area with three or four setae ventrally and three setae dorsally . . . . . **fossor** (Linnaeus)
7. Stridulatory area on stipes with 14–18 teeth; galea dorsally with seven setae; lacinia dorsally with a row of six long setae near the mesal edge and a short seta posteriorly; first and second antennal segments subequal, third short. **fimetarius** (Linnaeus)
   Stridulatory area on stipes with 6–10 teeth; galea dorsally with five setae; lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly; second and third antennal segments subequal, first long. . . . . **aleutus** Escholtz

8. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly; galea ventrally with a row of less than 11 short setae. . 9
   Lacinia dorsally with a row of eight long setae near the mesal edge and a short seta posteriorly; galea ventrally with a row of 11–14 short setae.
   hamatus Say
9. Abdominal segments 6–8 dorsally each with two transverse rows of setae. . 10
   Abdominal segments 6–8 dorsally with three transverse rows of setae; galea ventrally with a row of eight short setae; raster with 51–81 short tegillar setae; second and third antennal segments subequal, first long.
   vittatus Say
10. Galea ventrally with a row of eight or more short setae 11
    Galea ventrally with a row of six or seven short setae. Second and third antennal segments subequal, first long; maxillary stridulatory area on stipes with 8–10 teeth; raster with 36–50 tegillar setae. (Collected from ant's nest) . . . . . **Aphodius** sp.
11. Second and third antennal segments subequal, first long; width of head capsule 1.82–2.05 mm.; frons on each side with two depressions.
    sparsus LeConte
    First and third antennal segments subequal, second short; width of head capsule 0.86–0.92 mm.; frons on each side with four depressions in a line.
    neotomae Fall
12. Lacinia dorsally with a row of five long setae along the mesal edge and a short seta posteriorly; spiracle-bearing area with two setae ventrally; clypeus without any protuberance; lower anal lobe emarginate, partially subdivided into sublobes; claws slender 13
    Lacinia dorsally with a row of seven or eight long setae along the mesal edge and two or three short setae posteriorly; spiracle-bearing area with 4–6 setae ventrally; clypeus with a transverse broad protuberance in the middle of anterior margin of its sclerotized part; lower anal lobe emarginate, partially subdivided into four sublobes; claws rather short.
    erraticus (Linnaeus)
13. Galea ventrally with a row of seven or more short setae 14
    Galea ventrally with a row of five short setae. Abdominal segments 6–8 dorsally each with three transverse rows of setae; second and third antennal segments subequal, first long; width of head capsule 1.41–1.70 mm.; raster with 34–47 tegillar setae . . . . . **prodromus** Brahm
14. Raster with less than 43 tegillar setae 15
    Raster with more than 43 tegillar setae 17
15. Raster with more than 23 tegillar setae 16
    Raster with 17–22 tegillar setae; width of head capsule 0.89–0.96 mm.
    stercorosus Melsheimer
16. Abdominal segments 6–8 dorsally each with three transverse rows of setae; width of head capsule 1.25–1.35 mm.; frons on each side with two depressions.
    lividus (Oliver)
    Abdominal segments 6–8 dorsally each with two transverse rows of setae; width of head capsule 0.86–0.89 mm.; frons on each side with three depressions in a line . . . . . **troglodytes** Hubbard
17. Abdominal segments 6–8 dorsally each with three transverse rows of setae; first and second antennal segments subequal, third short; width of head capsule 1.22–1.45 mm. . . . . **haemorrhoidalis** (Linnaeus)
    Abdominal segments 6–8 dorsally each with two transverse rows of setae; first, second and third antennal segments subequal; width of head capsule 1.32–1.35 mm. . . . . **pectoralis** LeConte

Aphodius granarius (Linnaeus)

FIGURES 12, 23

MATERIAL EXAMINED: Six third-stage larvae collected from hard surface soil in horse pasture June 8, 1944, at Lexington, Ky., by Paul O. Ritcher, No. 44–7B (POR); two third-stage larvae collected at San Benito, Tex., by M. P. Jones (USNM); six third-stage larvae, associated with adults, collected in soil under cow dung at airport, Corvallis, Oreg., June 9, 1955, by Manohar Jerath; seven third-stage larvae and cast skins of five third-stage larvae reared to the adult stage, collected around mint roots near Prosser, Wash., Apr. 30, 1956, by K. E. Frick and S. G. Cole (reared adults determined by O. L. Cartwright).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.42–1.68 mm. Cranium light yellow to yellowish brown, surface smooth except for three depressions in a vertical line on the frons on each side, three or four dorsoepicranial setae and four or five microsensillae on each side. Second and third antennal segments subequal, first segment somewhat longer than second or third.

Epipharynx with protophoba tristichous or bistichous on left and monostichous on right; protophoba with 18–21 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subcircular; epitorma asymmetrical and bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 7–10 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of six or seven short setae, dorsally with five setae. Lacinia dorsally with a row of six long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with eight short setae, each scutum with 3–5 short setae and 2–4 long setae on each side, and each scutellum with 11 or 12 short setae. Each abdominal spiracle-bearing area with two setae dorsally and two setae ventrally.

Raster on each side with three short, longitudinal palidia, surrounded on the sides by 24–35 tegillar setae. Raster with 14–23 caudomesally directed, spine-like pali. Tegillar setae arranged in more or less regular rows, with varying number of setae in each row. Four minute setae anterior to the other setae.

Aphodius pardalis LeConte

FIGURE 69

MATERIAL EXAMINED: Three third-stage larvae collected from decaying lawn grass at San Francisco, Calif., Feb. 16, 1935, by P. C.

Ting (POR); 11 third-stage larvae collected from beneath injured turf in golf course at Eugene, Oreg., Apr. 26, 1954, by "R. H." (POR); 20 third-stage larvae collected at golf course, Eugene, Oreg., Apr. 28, 1954, by Paul O. Ritcher (reared adults identified by O. L. Cartwright) (POR).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.29–1.42 mm. Cranium light yellowish brown to yellowish brown, surface smooth except two depressions on each side on the frons, three dorsoepicranial setae and four microsensillae on each side. First antennal segment longer than second or third, second and third subequal.

Epipharynx with protophoba tristichous on left and monostichous on right; protophoba with 19–21 microsensillae. Tormae not similar in size and shape, dexiotorma produced cephalad and caudad, laeotorma only produced cephalad. Crepide small and irregular in outline; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 7–11 conical teeth; palpifer with one or two teeth. Galea ventrally with one long seta and a longitudinal row of 11 or 12 short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with two or three long setae and 3–5 short setae on each side, and each scutellum with 10 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with two short, longitudinal palidia, surrounded on the sides by scattered 16–31 tegillar setae. Each palidium with 6–10 caudomesally directed, spine-like setae.

Aphodius howitti Hope

MATERIAL EXAMINED: Fourteen third-stage larvae from "L. Chinnick," Australia (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 2.7–3.36 mm. Cranium yellowish brown to dark brown, surface smooth except for three depressions in a line on each side on the frons, four dorsoepicranial setae and three or four microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a small conical sensory structure apically.

Epipharynx with protophoba monostichous; protophoba with 18–20 microsensillae; dexiophoba bistichous. Tormae similar in size

and shape, both tormae only produced cephalad. Crepide subtriangular; epitorma small, asymmetrical.

Maxillary stridulatory area with an irregular row of 11–15 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of 10–12 short setae, dorsally with five or six setae. Lacinia dorsally with a row of eight or nine long setae near the mesal edge and two short setae posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with 6–12 setae, each scutum with 5–7 long setae and 9–10 short setae on each side, and each scutellum with 10–22 setae. Each abdominal spiracle-bearing area with two setae ventrally and two setae dorsally.

Raster with two short longitudinal palidia, surrounded on the sides by 50–60 hamate setae curved at their distal ends. Raster with 11–15 caudomesally directed, spine-like pali. Tegillar setae arranged in more or less regular rows, with varying number of setae in each row. Two minute setae anterior to the other setae.

Aphodius pseudotasmaniae Given

Material examined: Twelve third-stage larvae collected from pasture land at Kempton, Tasmania, July 30, 1951, by E. J. Martyn (USNM).

Description: Maximum width of head capsule of third-stage larva 2.97–3.20 mm. Cranium reddish brown, surface smooth except four depressions in a line on each side on the frons; three or four dorsoepicranial setae and five microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a conical sensory area apically.

Epipharynx with monostichous protophoba; protophoba with 18–20 microsensillae; dexiophoba bistichous. Tormae similar in size and shape, both tormae only produced cephalad. Crepide subtriangular; epitorma small and asymmetrical.

Maxillary stridulatory area with an irregular row of 13–20 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of 10 or 11 short setae, dorsally with six setae. Lacinia dorsally with a row of eight long setae near the mesal edge and two short setae posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with 6–12 setae, each scutum with 5–7 long setae and 9 or 10 short setae on each side, and each scutellum with 10–20 setae. Each abdominal spiracle-bearing area with one or two setae dorsally and two setae ventrally. Abdominal segments 7 and 8 broad, 9 and 10 narrow.

Raster with two short longitudinal palidia, surrounded on the sides by 51–55 hamate setae. Raster with 14–18 caudomesally directed pali. Tegillar setae arranged in more or less regular rows, with varying number of setae in each row. Two minute setae anterior to other setae.

Aphodius fossor (Linnaeus)

FIGURES 16, 17

MATERIAL EXAMINED: Two third-stage larvae collected at Riverton, N.J., June 1930, labeled by Sim (POR); nine third-stage larvae and four second-stage larvae collected in cow dung at Hyannis, Mass., June 27, 1939, by W. H. Anderson (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 3.26–3.68 mm. Cranium light reddish brown to dark reddish brown, surface smooth except for two depressions on each side on the frons, four dorsoepicranial setae and two microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a small conical sensory structure apically.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 15–18 microsensillae. Tormae not similar in size and shape, dexiotorma produced cephalad and caudad, laeotorma only produced cephalad. Crepide subtriangular; epitorma asymmetrical, slender and flattened apically.

Maxillary stridulatory area with an irregular row of 16–21 conical teeth; palpifer with 4–7 teeth. Galea ventrally with a long seta and a longitudinal row of 18–22 short setae, dorsally with eight setae. Lacinia dorsally with a row of nine long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with 12 short setae, each scutum with 2–5 long setae and 5–8 short setae on each side, and each scutellum with 16 short setae. Each abdominal spiracle-bearing area with three setae dorsally and three or four setae ventrally. Claws slender, pointed, and with only blunt nodule at the insertion of the setae.

Raster with teges of 130–165 small setae arranged more or less in rows with varying number of setae in each row.

Aphodius fimetarius (Linnaeus)

FIGURES 5, 14, 28, 42, 43, 52, 76, 82

MATERIAL EXAMINED: Four third-stage larvae collected and reared in cow dung at Urbana, Ill., May 28, 1931, by Carl Mohr (USNM); 22 third-stage larvae collected in cow dung at Nashville, Ark., Apr. 7, 1937, by W. H. Anderson (associated adults determined by E. A.

Chapin (USNM); 12 third-stage larvae collected in cow dung at Lexington, Ky., Apr. 24, 1944, by Paul O. Ritcher (POR); 15 third-stage larvae, associated with adults, collected in cow dropping at Salem, Oreg., July 11, 1955, by Manohar Jerath; 15 third-stage larvae, obtained by confining the adults of *Aphodius fimetarius* with fresh cow dung during spring of 1956 at Corvallis, Oreg., by Manohar Jerath.

Description: Maximum width of head capsule of third-stage larva 2.05–2.31 mm. Cranium yellowish brown to dark reddish brown, surface smooth except for three depressions in a line on each side on the frons, three or four dorsoepicranial setae and three microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a small conical sensory structure.

Epipharynx with protophoba bistichous or tristichous on left and monostichous on right; protophoba with 17–21 microsensillae. Tormae not similar in size and shape, dexiotorma produced cephalad and caudad, laeotorma only produced cephalad. Crepide subquadrangular; epitorma asymmetrical, flattened apically, and bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 14–18 conical teeth; palpifer with two or three teeth. Galea ventrally with a long seta and a longitudinal row of 17 short setae, dorsally with seven setae. Lacinia dorsally with a row of six long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with eight short setae, each scutum with 4–6 short setae and 3–5 long setae on each side, and each scutellum with 10–12 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one or two setae dorsally.

Raster with teges of 55–90 short setae curved at their distal ends. Tegillar setae scattered irregularly on the venter of 10th abdominal segment; four minute setae anterior to the tegillar setae.

Aphodius aleutus Eschscholtz

Material examined: Nine third-stage larvae obtained by confining adults of *A. aleutus* Eschscholtz with deer droppings from August to September 1955 at Corvallis, Oreg.; six third-stage larvae collected at Mary's Peak, 14 miles west of Corvallis, Oreg., Oct. 14, 1956, by Manohar Jerath (reared adults identified by O. L. Cartwright).

Description: Maximum width of head capsule of third-stage larva 1.52–1.68 mm. Cranium light yellowish brown to yellowish brown, surface smooth except for three depressions in a row on each side on the frons, four or five dorsoepicranial setae and three or four

microsensillae on each side. First antennal segment longer than second or third, second and third subequal.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 17–19 microsensillae. Tormae not similar in size and shape, dexiotorma produced cephalad and caudad, laeotorma only produced cephalad. Crepide subquadrangular; epitorma elongated and flattened apically.

Maxillary stridulatory area with a row of 6–10 conical teeth; palpifer with two or three teeth. Galea ventrally with a long seta and a longitudinal row of 15–17 short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: Each prescutum with six short setae, each scutum with five or six short setae and two or three long setae on each side, and each scutellum with 11 or 12 short setae. Each abdominal spiracle-bearing area with two setae ventrally and two setae dorsally.

Raster with teges of 50–72 setae scattered on the venter of 10th abdominal segment.

Aphodius hamatus Say

MATERIAL EXAMINED: Four third-stage larvae collected from pasture at Ruby Valley, Elko County, Nev., Nov. 12, 1956, by Mark Menke.

DESCRIPTION: Maximum width of head capsule of third-stage larva 2.87–3.00 mm. Cranium yellowish, surface smooth except for three depressions in a line on each side on the frons, three or four dorsoepicranial setae and six or seven microsensillae on each side. First and second antennal segments subequal, third shorter than first or second. Third antennal segment with a small conical sensory structure apically.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 18–21 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical, slender, and flattened apically.

Maxillary stridulatory area with a row of 9–12 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of 11–14 short setae, dorsally with five or six setae. Lacinia dorsally with a row of eight long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: Each prescutum with 20–25 setae, each scutum with 14–18 short setae and 7–10 long setae on each side, and each scutellum with 30–35 setae. Each abdominal spiracle-bearing area with two setae ventrally and two setae dorsally.

Raster with teges of 32–38 hamate setae arranged in five or six rows, with varying number of setae in each row; four minute setae anterior to the tegillar setae. Raster mostly covered by setae.

Aphodius vittatus Say

FIGURE 77

MATERIAL EXAMINED: 16 third-stage larvae, associated with adults, collected in cow manure at airport, Corvallis, Oreg., June 9, 1955, by Manohar Jerath (associated adults determined by O. L. Cartwright); 15 third-stage larvae, associated with adults, collected in cow manure at Oakville, Oreg., July 1, 1955, by Manohar Jerath; 20 third-stage larvae and cast skins of several third-stage larvae reared to the adult stage, being a part of many collected at Talent, Oreg., May 31, 1956, by Paul O. Ritcher (POR); 23 third-stage larvae and cast skins of several third-stage larvae reared to the adult stage, being a part of many collected three miles north of Cabin Lake, Lake County, Oreg., July 30, 1957, by Paul O. Ritcher and Manohar Jerath (No. 57–10a).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.12–1.25 mm. Cranium light yellowish brown, surface smooth except for four depressions in a line on each side on the frons, three dorsoepicranial setae and two microsensillae on each side. Second and third antennal segments subequal, first segment longer than second or third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 13–16 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical and slender.

Maxillary stridulatory area with an irregular row of 5–10 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of eight short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with two or three long setae and four or five short setae on each side, each scutellum with eight short setae. Each abdominal spiracle-bearing area with two setae ventrally and one or two setae dorsally. Abdominal segments 6–9 broader than segments 1–5.

Raster with teges of 51–81 short setae arranged more or less in irregular rows, with varying number of setae in each row.

Aphodius sp.

MATERIAL EXAMINED: Five third-stage larvae and one second-stage larva collected in *Formica* nest 8 miles east of Silver Lake, Oreg., May 16, 1957, by Paul O. Ritcher.

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.52–1.62 mm. Cranium light yellowish brown, surface smooth except for three depressions in a line on each side on the frons, 3–5 dorsoepicranial setae and 8–10 microsensillae on each side. Second and third antennal segments subequal, first longer than second or third.

Epipharynx with protophoba bistichous on the left and monostichous on right; protophoba with 17–19 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular to subquadrangular; epitorma asymmetrical, slender, flattened apically, and bent little towards laeophoba.

Maxillary stridulatory area with a row of 8–10 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of six or seven short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with six short setae; each scutum with three or four long setae and four or five short setae on each side; and each scutellum with 10–12 short setae. Each abdominal spiracle-bearing area with two setae dorsally and two setae ventrally.

Raster with teges of 36–50 hamate setae curved at their distal ends, setae arranged in irregular rows with variable number of setae in each row. Tegillar setae covering most of the venter of 10th abdominal segment.

***Aphodius sparsus* LeConte**

FIGURES 30, 56

MATERIAL EXAMINED: Three third-stage larvae collected from *Neotoma* nest at Colma, Calif., Feb. 24, 1934, by P. C. Ting (reared adults determined by F. Blaisdell) (USNM); 14 third-stage larvae reared by Paul O. Ritcher (No. 46–10C); 20 third-stage larvae and cast skins of 10 larvae reared to the adult stage, being part of a large number collected from a wood rat's nest 20 feet above the ground on a tree in McDonald forest, Corvallis, Oreg., May 21, 1957, by Paul O. Ritcher and Manohar Jerath (reared adults determined by O. L. Cartwright).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.82–2.05 mm. Cranium light yellow to light yellowish brown, surface smooth except for two depressions on each side on the frons, three or four dorsoepicranial setae and two microsensillae on each side. First antennal segment longer than second or third, second and third subequal. Third antennal segment with a small circular sensory area apically.

Epipharynx with protophoba tristichous on left and bistichous on right; protophoba with 18–22 microsensillae; dexiophoba bistichous. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical and elongated.

Maxillary stridulatory area with a row of 5–7 conical teeth; palpifer with one or two teeth. Galea ventrally with a long seta and a longitudinal row of 8–10 short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with eight short setae, each scutum with three or four long setae and five or six short setae on each side, and each scutellum with 12 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 41–60 setae curved at their distal ends, setae scattered irregularly on the venter of 10th abdominal segment.

***Aphodius neotomae* Fall**

MATERIAL EXAMINED: Six third-stage larvae reared by Paul O. Ritcher (No. 46-10D).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.86–0.92 mm. Cranium light yellow to light yellowish brown, surface smooth except for four depressions in a line on each side on the frons, three or four dorsoepicranial setae and three microsensillae on each side. First and third antennal segments subequal, second shorter than first or third.

Epipharynx with protophoba monostichous, three or four small processes on inside between dexiophoba and protophoba; protophoba with 11–14 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide small and subcircular; epitorma asymmetrical and flattened apically.

Maxillary stridulatory area with an irregular row of 6–10 conical teeth; palpifer with two or three teeth. Galea ventrally with a long seta and a longitudinal row of nine short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three or four short setae and three long setae on each side, and each scutellum with 10 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 35–46 short setae scattered irregularly on the venter of 10th abdominal segment. Lower anal lobe swollen into two lobes, but not definitely divided.

Aphodius erraticus (Linnaeus)

FIGURES 3, 29, 41, 85

MATERIAL EXAMINED: Eight third-stage larvae collected in soil beneath cow dung at College Park, Md., May 28, 1939, by W. H. Anderson (reared adults determined by E. A. Chapin) (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 2.27–2.40 mm. Cranium yellowish brown, surface smooth except for three depressions in a line on each side on the frons. Clypeus with a transverse broad protuberance in middle of anterior margin of its sclerotized part, anterior angles of the latter raised into a tubercle. Second and third antennal segments subequal, first longer than second or third.

Epipharynx tristichous on left and monostichous on right; protophoba with 19–21 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subquadrangular; epitorma asymmetrical.

Maxillary stridulatory area with a row of 9–13 conical teeth; none on palpifer. Galea, ventrally with a long seta and a longitudinal row of eight or nine short setae, dorsally with six or seven setae. Lacinia dorsally with a row of seven or eight long setae near the mesal edge and two or three short setae posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with 10 short setae, each scutum with 4–6 long setae and 11–15 short setae on each side, and each scutellum with 16 short setae. Each abdominal spiracle-bearing area with two or three setae dorsally and 4–6 setae ventrally. Claw rather short, practically cylindrical in basal half, spinules strong.

Raster with teges of 52–75 short setae arranged in more or less regular rows, with varying number of setae in each row. Four minute setae anterior to the other setae. Lower anal lobe marked into four sublobes, upper anal lobe horse-shoe-shaped.

Aphodius prodromus (Brahm)

FIGURE 67

MATERIAL EXAMINED: Six third-stage larvae obtained by confining the adults with horse manure during May 1944, at Lexington, Ky., by Paul O. Ritcher (No. 44–7D); two third-stage larvae obtained by confining the adults with horse manure during April 1945, at Lexington, Ky., by Paul O. Ritcher (No. 45–3A).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.41–1.70 mm. Cranium light yellowish brown to yellowish brown, surface smooth except for three depressions in a line on each side on the frons, four dorsoepicranial setae and two microsensillae on each

side. Second and third antennal segments subequal, first longer than second or third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 17–19 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide irregular; epitorma asymmetrical, flattened apically, and little bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 8–11 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of five short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Abdominal segments 1–5 each with three dorsal annulets; each prescutum with six short setae, each scutum with two or three long setae and three or four short setae on each side, and each scutellum with 10 short setae. Each abdominal spiracle-bearing area with two or three setae ventrally and one or two setae dorsally.

Raster with teges of 34–47 setae arranged more or less in irregular rows, with varying number of setae in each row; four minute setae anterior to tegillar setae.

Aphodius stercorosus Melsheimer

FIGURE 54

MATERIAL EXAMINED: Twelve third-stage larvae reared at Lexington, Ky., by Paul O. Ritcher (No. 44 7P(B)); 5 third-stage larvae reared at Lexington, Ky., June 20, 1945, by Paul O. Ritcher (No. 44–7P) (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.89–0.96 mm. Cranium light yellow, surface smooth except for two depressions on each side on the frons, two or three dorsoepicranial setae and three or four microsensillae on each side. Third antennal segment with a flattened sensory area apically. First antennal segment longer than second or third, second shorter than third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical and flattened apically.

Maxillary stridulatory area with an irregular row of 7–9 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of seven or eight short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with two or three

long setae and three or four short setae on each side, and each scutellum with eight short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 17–22 setae arranged more or less in four rows on the venter of 10th abdominal segment.

Aphodius lividus (Olivier)

FIGURE 63

MATERIAL EXAMINED: Ten third-stage larvae, associated with adults, collected in cow manure at Dallas, Tex., Sept. 9, 1907, by F. C. Pratt (associated adults determined by E. A. Schwarz) (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.25–1.35 mm. Cranium yellowish, surface smooth except for two depressions on each side on the frons, three dorsoepicranial setae and two microsensillae on each side. First antennal segment longer than second or third, second and third subequal.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 17–19 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical and flattened apically.

Maxillary stridulatory area with an irregular row of 8–12 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of eight short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with eight short setae, each scutum with two or three long setae and four or five short setae on each side, and each scutellum with 12 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 27–42 short setae curved at their distal ends, four minute setae anterior to the other setae. Tegillar setae scattered irregularly on the venter of 10th abdominal segment.

Aphodius troglodytes Hubbard

FIGURE 15

MATERIAL EXAMINED: Five third-stage larvae collected at Crescent City, Fla., Jan. 29, 1893, and June 1894 by Hubbard (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.86–0.89 mm. Cranium light yellow, surface smooth except for three small depressions in a line on each side on the frons and two dorsoepicranial setae and one microsensilla on each side. First antennal segment longer than second or third, second and third subequal. Third antennal segment with a flattened sensory area apically.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 13–15 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide irregular; epitorma asymmetrical and flattened apically.

Maxillary stridulatory area with an irregular row of 8–11 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of eight short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three or four short setae and three or four long setae on each side, and each scutellum with 10 short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally. Tenth abdominal segment narrows considerably.

Raster with teges of 26–32 hamate setae curved at their distal ends, setae arranged more or less in rows with varying number of setae in each row.

***Aphodius haemorrhoidalis* (Linnaeus)**

FIGURE 55

MATERIAL EXAMINED: Twelve third-stage larvae collected in cow dung at Hyannis, Mass., June 27, 1939, by Wm. H. Anderson (USNM); 35 third-stage larvae obtained by confining the adults with fresh cow manure from Apr. 27 to May 26, 1944, at Lexington, Ky., by Paul O. Ritcher (Nos. 44-7C(1), 44-7C(2), 44-7C(3)).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.22–1.45 mm. Cranium light yellow to light yellowish brown, surface smooth except for two depressions on the frons on each side, two or three dorsoepicranial setae and three or four microsensillae on each side. First and second antennal segments subequal, third shorter than first or second.

Epipharynx with protophoba polystichous on left and monostichous on right; protophoba with 15–17 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide small and irregular; epitorma asymmetrical.

Maxillary stridulatory area with an irregular row of 7–10 conical teeth, none on palpifer. Galea ventrally with a long seta and a longitudinal row of 8–10 short setae, dorsally with five or six setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with two or three long setae and three or four short setae on each side, and each scutellum with eight short setae. Each abdominal spiracle-bearing area

with two setae ventrally and one seta dorsally. Abdominal segments 7–9 broader than the other segments.

Raster with teges of 51–81 short setae scattered irregularly on the venter of 10th abdominal segment.

Aphodius pectoralis LeConte

MATERIAL EXAMINED: Three third-stage larvae and cast skins of seven third-stage larvae reared to the adult stage, collected under deer droppings at Kiwanda dunes, Pacific City, Oreg., Aug. 7, 1955, by Mrs. D. McKey Fender (reared adults determined by O. L. Cartwright).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.32–1.35 mm. Cranium yellowish brown, surface smooth except for one depression on each side on the frons, three dorsoepicranial setae and three or four microsensillae on each side. First, second, and third antennal segments subequal.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae. Tormae similar in size and shape, both tormae produced cephalad and caudad. Crepide subtriangular; epitorma asymmetrical, flattened apically and little bent towards laeophoba.

Maxillary stridulatory area with an irregular row of 9–12 conical teeth; none on palpifer. Galea ventrally with a long seta and a longitudinal row of nine or ten short setae, dorsally with five setae. Lacinia dorsally with a row of five long setae near the mesal edge and one short seta posteriorly.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three or four short setae and three or four long setae on each side, and each scutellum with eight short setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 57–68 short setae scattered irregularly on the venter of 10th abdominal segment.

Tribe EUPARIINI

This tribe is represented in the United States by 8 of the 14 known genera—*Euparia* Serville, *Ataenius* Harold, *Dialytes* Harold, *Euparixia* Brown, *Pseudataenius* Brown, *Saprosites* Redtenbacher, *Dialytellus* Brown, and *Aphotaenius* Cartwright. *Euparia*, *Euparixia*, *Pseudataenius*, *Saprosites*, and *Aphotaenius* are represented by single species only.

Species dealt with in this study include *Aphotaenius carolinus* (Van Dyke), *Saprosites pygmaeus* Harold, *Euparia castanea* Serville, and 12 species of the genus *Ataenius*.

These larvae were obtained largely from the U.S. National Museum; two species of *Ataenius* were from Paul O. Ritcher's personal collection.

Four genera studied here represent two clearly separable subgroups. *Ataenius* and *Euparia* belong in one group on the basis of the setae on the frons and clypeus, antennal segments, shape of the tormae, and the number of the tegillar setae on the raster. *Aphotaenius* and *Saprosites* fall in a second group which lacks posterior frontal and anterior frontal setae. In the same group, the clypeus has one seta on each side, the galea has four dorsal setae, and the raster has but few setae.

In a personal communication, O. L. Cartwright of the U.S. National Museum expresses the same idea concerning the relationships of genera based on the adults of this tribe.

Key to larvae of four genera of the tribe Eupariini

1. Clypeus with one seta on each side; frons without posterior frontal and anterior frontal setae; maxillary stridulatory area either without teeth or with less than five teeth; raster with less than 23 tegillar setae 2
   Clypeus with three setae on each side; frons with two posterior frontal setae and one anterior frontal seta; maxillary stridulatory area with more than seven teeth; raster with more than 25 tegillar setae 3
2. First, second, and third antennal segments subequal; lacinia without terminal uncus; maxillary stridulatory area without teeth; raster with 10–12 tegillar setae . . . . . **Saprosites** Redtenbacher
   Second and third antennal segments subequal, first short; lacinia with terminal uncus; galea ventrally with six or seven short setae; maxillary stridulatory area with four or five conical teeth; raster with 19–23 tegillar setae. **Aphotaenius** Cartwright
3. Galea ventrally with a row of six or seven short setae, dorsally with four stout setae . . . . . **Euparia** Serville
   Galea ventrally with a row of four or five short setae, dorsally with three stout setae . . . . . **Ataenius** Harold

Saprosites pygmaeus Harold

Figures 7, 46, 62, 68, 83, 88

Material examined: Two third-stage larvae, associated with adults, collected under rotten logs at Kalawas, Oahu, Hawaii, Mar. 1, 1931, by "O. H. S." (USNM); four third-stage larvae and two second-stage larvae collected at Palmyra Island, February 1948, by N. L. H. Krauss (USNM).

Description: Maximum width of head capsule of third-stage larva 0.63–0.69 mm. Cranium light yellow, surface smooth. Frons on each side with one long exterior frontal seta and a seta in each anterior angle. Five dorsoepicranial setae and three microsensillae on each side. First, second, and third antennal segments subequal, fourth

short and conical. Clypeus not marked into preclypeus and postclypeus; clypeus with one seta on each side.

Epipharynx slightly longer than broad. Protophoba bistichous and with 7–9 microsensillae; dexiophoba polystichous; laeophoba and mesophoba monostichous. Crepide small with six microsensillae. Tormae asymmetrical, dexiotorma produced cephalad and caudad, laeotorma only produced caudad and twice as long as dexiotorma.

Scissorial area of left mandible with S_1, S_2, S_3, and S_4, and of right mandible with S_1, S_2 and S_{3+4}. Each mandible dorsally with two setae and ventrally with a single seta.

Maxillary stridulatory area without teeth; palpifer not differentiated. Galea with a single apical uncus, dorsally with four stout setae and ventrally with a single long seta and a row of three short setae. Lacinia without terminal uncus, dorsally with four stout setae near the mesal edge and a short seta posteriorly. Labial palps 1-segmented; four microsensillae and a pair of short setae on the glossa between the labial palps.

Legs with tibiotarsus small, nearly twice as long as broad, bearing a simple claw.

Abdominal segments 1–8 each with three dorsal annulets, a prescutum, a scutum, and a scutellum; each annulet with a transverse row of setae except the last annulet of segments 6–8. Segments 7–9 broad but segment 10 distinctly narrow. Segment 9 with two dorsal annulets, each annulet with a transverse row of setae; segment 10 with one transverse row of setae. Each abdominal spiracle-bearing area with two setae ventrally and one or two setae dorsally.

Raster with teges of 10–12 hamate setae placed more or less regularly in four rows; the outer row of one or two setae and inner row of four setae each; setae curved at their distal ends. Lower anal lobe divided into two closely placed sublobes.

Aphotaenius carolinus (Van Dyke)

FIGURES 11, 18, 34, 35, 47, 57, 74

MATERIAL EXAMINED: Four third-stage larvae reared by O. L. Cartwright, Nov. 14, 1941 (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.68–0.73 mm. Cranium light yellow, surface smooth. Frons on each side with a long exterior frontal seta and a seta in each anterior angle. Four or five dorsoepicranial setae on each side. Second and third antennal segments subequal, first smaller than second or third. Clypeus faintly marked into a small preclypeus and large postclypeus; clypeus with a single seta on each side.

Epipharynx slightly broader than long. Protophoba bistichous on left and monostichous on right and with 11–14 microsensillae. Meso-

phoba occupied by series of hairlike structures, arranged irregularly. Crepide small; epitorma asymmetrical. Tormae not similar in size and shape; only dexiotorma produced cephalad and caudad.

Maxillary stridulatory area with an irregular row of four or five blunt teeth; none on palpifer. Galea dorsally with four stout setae, ventrally with a long seta and a longitudinal row of six or seven short setae. Lacinia with a terminal uncus of two ventral toothlike lobes, dorsally with a row of four or five long setae near the mesal edge and a short seta posteriorly. Palpifer not differentiated.

Abdominal segments 1–5 each with three dorsal annulets; each annulet with a transverse row of setae. Segment 6 with two dorsal annulets, each with a transverse row of setae. Segments 7–9 each with two transverse rows of setae but dorsa not divided. Dorsa of segment 10 with a single transverse row of setae. Each abdominal spiracle-bearing area with two setae ventrally and one or two setae dorsally.

Raster with teges of 19–23 hamate setae arranged more or less in four rows of 5–7 setae in the inner rows and 4–6 setae in the outer rows; setae more or less caudally directed. Lower anal lobe divided into two laterally placed sublobes.

Euparia castanea Serville

FIGURES 4, 20, 24, 31, 44, 45, 61

MATERIAL EXAMINED: Four third-stage larvae and two second-stage larvae, labeled "2393, box 9/129, Selma, Ala." (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.35–1.42 mm. Cranium light yellow, surface smooth. Frons on each side with two short posterior frontal setae and a microsensilla, a short anterior frontal setae and a microsensilla, a long exterior frontal seta and a microsensilla, and a long seta at each anterior angle. Frontal sutures indistinct. Second and third antennal segments subequal, first longer than second or third. Clypeus not marked into preclypeus and postclypeus; clypeus with three setae on each side.

Epipharynx slightly broader than long. Protophoba bistichous on left and monostichous on right; protophoba with 18 or 19 microsensillae. Laeophoba polystichous and mesophoba monostichous. Crepide W-shaped and with two microsensillae. Tormae asymmetrical, dexiotorma produced cephalad and caudad, laeotorma weakly sclerotized and slightly produced caudad and cephalad.

Scissorial area of left mandible with S_1, S_2, S_3 and S_4 and of right mandible with S_{1+2} and S_{3+4}. Each mandible dorsally with two setae.

Maxillary stridulatory area with an irregular row of numerous small blunt teeth. Galea with a single apical uncus, dorsally with four stout setae and ventrally with a long seta and a row of six or seven

short setae. Lacinia with a terminal uncus of two ventral toothlike lobes, dorsally with a row of five long setae near the mesal edge and a short seta posteriorly. Palpifer indistinct.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. Segments 7 and 8 each with two dorsal annulets, each annulet with a transverse row of setae. Dorsa of segments 9 and 10 each with a transverse row of setae. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 55–71 hamate setae scattered irregularly on the venter of 10th abdominal segment. Setae curved at their distal ends. Lower anal lobe divided into two adjacent sublobes.

Genus *Ataenius* Harold

Larvae of this genus may be characterized as follows: Frons on each side with two posterior frontal setae and a microsensilla, a long seta at each anterior angle, a single long exterior frontal seta and a microsensilla, and a short anterior frontal seta and a microsensilla. Each antennal base with two long setae and one short seta exterolaterally and a long seta dorsally. Second and third antennal segments subequal, first long. Tormae asymmetrical; dexiotorma produced cephalad and caudad into an armlike structure; laeotorma shorter than dexiotorma and slightly produced cephalad and caudad with ends blunt. Scissorial area of left mandible with S_{1+2}, S_3 and S_4. Galea ventrally with four or five short setae, dorsally with three stout setae. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly. Labial palp 2-segmented. Spiracular concavity facing ventrally. Lower anal lobe divided into two distinct sublobes.

Key to known larvae of *Ataenius*

1. Seventh and eighth abdominal segments broad, ninth and tenth abdominal segments narrow (fig. 81) 4
   Seventh to tenth abdominal segments similar in breadth (fig. 80) 2
2. Raster with teges of 28–36 setae; blunt stridulatory teeth on stipes 8–11 . . 3
   Raster with teges of 41 setae; conical stridulatory teeth on stipes 15 (2 depressions on each side on the frons) . . . . . **Ataenius** sp. (*strigatus* group)
3. Each mandible ventrally without setae; labium with one microsensilla for each two processes in the transverse row of closely appressed processes on glossa . . . . . **Ataenius** sp. (*strigatus* group)
   Each mandible ventrally with two setae; labium with one microsensilla for each process in the transverse row of closely appressed processes on glossa. **saxatilis** Cartwright
4. Stridulatory teeth on stipes 19 or fewer 5
   Stridulatory teeth on stipes 20 or more 8

5. Raster with teges of more than 39 setae 6
Raster with teges of fewer than 39 setae (27–31, 34–37) (each mandible dorsally with two setae and ventrally with two setae; conical stridulatory teeth on stipes 13–19) . . . . . **ovatulus** Horn
6. Frontal sutures distinct 7
Frontal sutures indistinct (blunt stridulatory teeth on stipes 12–15) **Ataenius** sp. (*strigatus* group)
7. Conical stridulatory teeth on stipes 13–16; raster with teges of 50–56 setae. **strigicauda** Bates
Blunt stridulatory teeth on stipes 9–11; raster with teges of 40 setae. **brevis** Fall
8. Raster with teges of 50 or fewer setae 9
Raster with teges of 54 setae (blunt stridulatory teeth on stipes 21–23; each mandible with two setae dorsally and two setae ventrally). **schwarzi** (Linell)
9. Clypeus not marked into preclypeus and postclypeus; lower anal lobe divided into two distinct sublobes placed remote from each other 10
Clypeus marked into preclypeus and postclypeus; lower anal lobe divided into two adjacently placed sublobes 11
10. Raster with teges of 44–50 hamate setae; width of head capsule 1.32–1.35 mm. **erratus** Fall
Raster with teges of 34–43 hamate setae; width of head capsule 1.02–1.12 mm. **imbricatus** Melsheimer
11. Stridulatory teeth on stipes 20–25; each mandible with two setae dorsally and one seta ventrally; width of head capsule 1.06–1.12 mm. **plantensis** (Blanchard)
Stridulatory teeth on stipes 28–34; each mandible with two setae dorsally and two setae ventrally; width of head capsule 1.29–1.32 mm. . . . **Ataenius** sp.

Ataenius sp. 1 (*strigatus* group)

FIGURE 8

MATERIAL EXAMINED: One third-stage larva, associated with adults, collected at U.S. Golf Association, Washington, D.C., July 1, 1924, by M. C. Biber (POR). [This larva was associated with adults of *A. spretulus* (Haldeman) and *A. strigatus* (Say). Other species in the group may occur in the same area.]

Description: Maximum width of head capsule of third-stage larva 1.19 mm. Cranium brownish yellow, subsurface smooth except for two depressions on each side on the frons. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus divided into smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Mandibles brownish yellow with scissorial and molar area dark brown. Each mandible dorsally with a single seta, ventrally with two setae. Brustia well developed on left mandible but not so developed on right mandible.

Maxillary stridulatory area with an irregular row of 15 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 each with two dorsal annulets and each annulet with a transverse row of setae; segments 9 and 10 each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 41 hamate setae scattered irregularly on the venter of 10th abdominal segment, three or four long setae on each side. Lower anal lobe divided into two adjacent sublobes.

Ataenius sp. 2 (*strigatus* group)

Material examined: One third-stage larva collected in soil at Lamont, Wis., Aug. 16, 1940, by Seaton (reared adults determined by E. A. Chapin) (USNM). [The reared adults were determined as *A. falli* Hinton, a synonym of *A. spretulus* (Haldeman). A soil-collected larva might have been either this species or A. *strigatus* (Say).]

Description: Maximum width of head capsule of third-stage larva 1.22 mm. Cranium light yellow, surface smooth. Three dorsocpicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus marked into smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical, flattened apically and bent towards lacophoba.

Mandibles yellowish brown with scissorial and molar area reddish brown. Each mandible dorsally with one long seta and one short seta, ventrally without setae. Brustia well developed on left mandible, but not so developed on right mandible.

Maxillary stridulatory area with a row of 10 or 11 blunt teeth, facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with one long seta and a row of four short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short

setae on each side, and each scutellum with 10 short setae. Abdominal segments 7–10 similar in breadth; segments 9 and 10 each with two transverse rows of closely placed setae, but dorsa not divided.

Raster with teges of 36 hamate setae scattered irregularly on the venter of 10th abdominal segment, three long and slender setae on each side. Lower anal lobe divided into two adjacent sublobes.

Ataenius saxatilis Cartwright

FIGURES 1, 19, 27, 32, 48, 58, 78, 80, 84

Description based on the following material:

MATERIAL EXAMINED: 30 third-stage larvae reared in soil from type locality July 31 to Sept. 2, 1949, by O. L. Cartwright (USNM); 10 third-stage larvae reared in sand from type locality Nov. 18, 1952, by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.02–1.09 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae on each side. Frontal sutures distinct. Clypeus not marked into preclypeus and postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 17–19 microsensillae; laeophoba polystichous; dexiophoba and mesophoba monostichous. Crepide small and subcircular; epitorma asymmetrical, bilobed apically and bent towards laeophoba.

Mandibles yellowish brown with scissorial and molar area reddish brown. Each mandible dorsally with two setae, ventrally with two or three setae. Brustia well developed on left mandible but weak and indistinct on right mandible.

Maxillary stridulatory area with a row of 8–10 blunt teeth; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four of five short setae. Palpifer distinct.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae, except the last annulet of segment 6. Dorsal annulets of segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three short setae and three long setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 each with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 each with two closely placed transverse rows of setae, but dorsa not divided. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.

Raster with teges of 28–35 hamate setae with curved tips, setae scattered irregularly, five or six long setae on either side. Lower anal lobe divided into two sublobes remote from each other.

Ataenius ovatulus Horn

FIGURE 49

MATERIAL EXAMINED: Six third-stage larvae reared Nov. 15, 1941, by O. L. Cartwright (USNM); three third-stage larvae collected at River Falls, S.C., Aug. 27, 1942, by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.89–0.99 mm. Cranium yellowish brown, surface smooth except for two depressions on each side on the frons. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus distinctly divided into preclypeus and postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae; mesophoba monostichous in the middle and polystichous on the sides. Crepide small and subcircular; epitorma asymmetrical and flattened apically.

Mandibles light yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with two setae and ventrally with two setae. Brustia equally developed on both the mandibles.

Maxillary stridulatory area with an irregular row of 13–19 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad; segments 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 26–31 and 34–37 hamate setae scattered irregularly on the venter of 10th abdominal segment, three long and slender setae on each side. Lower anal lobe divided into two adjacent sublobes.

Ataenius sp. 3 (*strigatus* group)

FIGURES 33, 59, 75

MATERIAL EXAMINED: Four third-stage larvae collected under grass roots July 18, 1939, at Philadelphia, Pa. (USNM). [These larvae were collected with one newly emerged adult of *Ataenius spretulus* (Haldeman) but others in the *strigatus* group are found in the same area.]

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.32–1.35 mm. Cranium yellowish brown, surface smooth. Three

dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus distinctly divided into smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16–18 microsensillae; mesophoba polystichous. Crepide flask-shaped; epitorma asymmetrical, flattened apically and bent towards lacophoba.

Mandibles yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with a single seta, ventrally without setae.

Maxillary stridulatory area with an irregular row of 12–15 teeth pointing cephalad. Galea ventrally with a long seta and a row of four or five short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 40–45 hamate setae scattered irregularly on the venter of 10th abdominal segment, four or five long slender setae on each side. Lower anal lobe divided into two sublobes placed laterally.

Ataenius strigicauda Bates

FIGURE 81

MATERIAL EXAMINED: Six third-stage larvae and two second-stage larvae reared in original soil Aug. 26 to Sept. 29, 1945, by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.32–1.38 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus distinctly divided into smaller preclypeus and large postclypeus.

Epipharynx with clithra enlarged mesally. Protophoba bistichous on left and monostichous on right, with 16–18 microsensillae; mesophoba monostichous in the middle and polystichous on the sides. Crepide small and subcircular; epitorma asymmetrical and flattened apically.

Mandibles yellowish brown with scissorial and molar area reddish brown. Each mandible dorsally with two setae, ventrally with two setae, brustia well developed on left mandible but not so on right mandible.

Maxillary stridulatory area with an irregular row of 13–16 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of five short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with four long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 50–56 hamate setae scattered irregularly on the venter of 10th abdominal segment, three or four long setae on either side. Lower anal lobe divided into two sublobes placed close to each other.

***Ataenius brevis* Fall**

Material examined: One third-stage larva, associated with adults, collected at River Falls, S.C. Aug. 27, 1942, by O. L. Cartwright (USNM).

Description: Maximum width of head capsule of third-stage larva 1.09 mm. Cranium yellowish brown, surface smooth. Five dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus distinctly divided into smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 15 microsensillae; mesophoba monostichous in the middle and polystichous on the sides. Crepide small and semicircular; epitorma asymmetrical, flattened, bilobed apically and bent towards laeophoba.

Mandibles yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with a single seta, ventrally with two setae. Brustia poorly developed on right mandible.

Maxillary stridulatory area with an irregular row of 9–11 blunt teeth facing cephalad; small toothlike marking behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of

segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with four long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two dorsal rows of closely placed setae but dorsa not divided.

Raster with teges of 40 hamate setae scattered irregularly on the venter of 10th abdominal segment, four or five long setae on each side. Lower anal lobe divided into two sublobes placed close to each other.

Ataenius schwarzi (Linell)

Material examined: One third-stage larva reared, killed in hot water, and preserved in alcohol Oct. 16, 1944, by O. L. Cartwright (USNM).

Maximum width of head capsule of third-stage larva 1.09 mm. Cranium light yellow, surface smooth. Four or five dorsoepicranial setae on each side. Frontal sutures distinct. Clypeus distinctly divided into a smaller preclypeus and large postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 15 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical and flattened apically.

Mandibles brownish yellow with scissorial and molar area dark brown. Each mandible dorsally with two setae, ventrally with two setae. Brustia well developed on both mandibles.

Maxillary stridulatory area with an irregular row of 21–23 blunt teeth facing cephalad. Galea ventrally with a long seta and a row of five short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5 each prescutum with six short setae, each scutum with three long setae and four short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 54 hamate setae curved at their distal ends, two or three long slender setae on each side. Lower anal lobe divided into two adjacent sublobes.

Ataenius erratus Fall

Material examined: One third-stage larva and 11 second-stage larvae reared in soil, cow manure, and dry cereal Sept. 3, 1942, at Clemson, S.C., by O. L. Cartwright (USNM); two third-stage and

six second-stage larvae reared in cow dung and sand Nov. 18, 1942, by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.32–1.35 mm. Cranium yellowish, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus not marked into preclypeus and postclypeus.

Epipharynx with protophoba tristichous on left and monostichous on right; protophoba with 17–19 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical, flattened, bilobed apically and bent towards laeophoba.

Mandibles light yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with two setae, ventrally with one seta. Brustia poorly developed on right mandible.

Maxillary stridulatory area with an irregular row of 24–28 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four or five short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5, each prescutum with six short setae, each scutum with three long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad, 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 44–50 hamate setae curved at their distal ends; two or three long and slender setae on each side. Lower anal lobe divided into two sublobes placed remote from each other.

Ataenius imbricatus (Melsheimer)

MATERIAL EXAMINED: Twelve third-stage larvae reared Apr. 28 to June 2, 1944, at Clemson, S.C., by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.02–1.12 mm. Cranium light yellow, surface smooth except for two depressions on each side on the frons. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus not marked into preclypeus and postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 13–15 microsensillae; mesophoba monostichous in the middle and polystichous on the sides. Crepide small and subcircular; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Mandibles light yellowish brown with scissorial and molar area reddish brown. Each mandible dorsally with two setae, ventrally

with one or two setae. Brustia poorly developed on right mandible.

Maxillary stridulatory area with an irregular row of 21–24 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four or five short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5, each prescutum with six short setae, each scutum with four long setae and three short setae on each side, and each scutellum with 10 short setae. Segments 7 and 8 broad; 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 34–43 hamate setae curved at their outer ends; three long and slender setae on either side. Lower anal lobe divided into two sublobes remote from each other.

Ataenius platensis (Blanchard)

Material examined: Three third-stage larvae and three second-stage larvae reared in cow manure Sept. 2, 1942, at Clemson, S.C., by O. L. Cartwright (USNM); three third-stage larvae reared in cow dung and sand Nov. 18, 1942, by O. L. Cartwright (USNM).

Maximum width of head capsule of third-stage larva 1.06–1.12 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus divided into a smaller preclypeus and large postclypeus.

Epipharynx with clithra enlarged mesally; protophoba bistichous on left and monostichous on right, with 15–17 microsensillae; mesophoba polystichous. Crepide small and subsquare; epitorma asymmetrical and flattened apically.

Mandibles light yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with two setae, ventrally with a single short seta. Brustia poorly developed on right mandible.

Maxillary stridulatory area with an irregular row of 20–25 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea with a long seta and a row of four short setae.

Abdominal segments 1–6 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segment 6. On the annulets of segments 1–5, each prescutum with six short setae, each scutum with three long setae and four short setae on each side, and each scutellum with 10 short setae. Abdominal segments 7 and 8 broad, each segment with two dorsal annulets and each annulet with a transverse row of setae. Segments 9 and 10 narrow, each with two transverse, closely placed rows of setae but dorsa not divided.

Raster with teges of 42–44 hamate setae scattered irregularly on the venter of 10th abdominal segment, three or four long and slender setae on each side. Lower anal lobe distinctly divided into two sublobes placed close to each other.

Ataenius sp. 4

MATERIAL EXAMINED: Ten third-stage larvae collected at Edgewater Golf Club, Chicago, Ill., Sept. 11, 1951, by A. M. Radke (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 1.29–1.32 mm. Cranium light yellow, surface smooth except for two depressions on each side on the frons. Three dorsoepicranial setae and two microsensillae on each side. Frontal sutures distinct. Clypeus divided into preclypeus and postclypeus.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 16 microsensillae; mesophoba polystichous. Crepide small and subcircular; epitorma asymmetrical, flattened apically and bent towards laeophoba.

Mandibles light yellowish brown with scissorial and molar area dark brown. Each mandible dorsally with two setae, ventrally with two setae. Brustia equally developed on both the mandibles.

Maxillary stridulatory area with an irregular row of 28–34 conical teeth facing cephalad; small toothlike markings behind the plectrum and on cardo. Galea ventrally with a long seta and a row of four short setae.

Abdominal segments 1–8 each with three dorsal annulets; each annulet with a transverse row of setae except the last annulet of segments 6–8. On the annulets of segments 1–5, each prescutum with six short setae, each scutum with four long setae and three short setae on each side, and each scutellum with 10 short setae. Abdominal segments 7 and 8 broad; 9 and 10 narrow, each with two transverse rows of closely placed setae but dorsa not divided.

Raster with teges of 42–49 hamate setae curved at their distal ends; two or three long and slender setae on each side. Lower anal lobe divided into two sublobes placed adjacent to each other.

Tribe PSAMMODIINI

This tribe is represented in the United States by four of the 10 known genera—*Psammodius* Fallen, *Pleurophorus* Mulsant, *Trichiorhyssemus* Clouet, and *Rhyssemus* Mulsant.

Species dealt with in this study include *Psammodius oregonensis* Cartwright, *Psammodius hydropicus* Horn, *Pleurophorus caesus* (Creutzer) and *Pleurophorus longulus* Cartwright. Larvae of *Pleuro-*

phorus caesus (Creutzer), *Pleurophorus longulus* Cartwright, and *Psammodius hydropicus* Horn were obtained from the U.S. National Museum. Larvae of *Psammodius oregonensis* Cartwright were collected in the sand dunes at Waldport, Oreg.

Larvae of this tribe may be characterized as follows: Frons on each side with a single short posterior frontal seta and a microsensilla, a short anterior frontal seta and a microsensilla, a long exterior frontal seta and a microsensilla, and a long seta at each anterior angle. Scissorial area of left mandible with S_{1+2}, S_3, and S_4, of right mandible with S_{1+2} and S_{3+4}. Galea dorsally with three stout setae. Palpifer differentiated; stipes without stridulatory teeth.

Abdominal segments 1–5 each with three dorsal annulets; each annulet with a transverse row of setae. Segments 6–8 each with three transverse rows of setae but dorsa not divided. Segments 9 and 10 each with two transverse rows of setae, dorsa not divided. Lower anal lobe subdivided into two distinct sublobes.

Key to larvae of two genera of the tribe Psammodiini

Galea ventrally with a long seta and a row of three short setae; each abdominal spiracle-bearing area with 6–8 setae ventrally and two setae dorsally.
Psammodius Fallen

Galea ventrally with a long seta and two short setae; each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally.
Pleurophorus Mulsant

Genus *Psammodius* Fallen

Larvae of this genus may be characterized as follows: Clypeus divided into smaller preclypeus and large postclypeus. First and third antennal segments subequal, second shorter than first and third. Epipharynx with dexiophoba and laeophoba monostichous; mesophoba incomplete in the middle and polystichous on the sides. Dexiotorma produced cephalad and caudad into an armlike structure; laeotorma small and slightly produced caudad with end blunt.

Galea ventrally with a long seta and a row of three short setae. Lacinia dorsally with a row of five long setae near the mesal edge and a short seta posteriorly. Each abdominal spiracle-bearing area with 6–8 setae ventrally and two setae dorsally. Lower anal lobe divided into two sublobes remote from each other.

Key to the known larvae of Psammodius

Frons without depressions; each antennal base with two long setae and two short setae exterolaterally; tibiotarsus nearly three times as long as wide.
oregonensis Cartwright

Frons with two depressions on each side; each antennal base with two long setae and one short seta exterolaterally; tibiotarsus nearly twice as long as wide.
hydropicus Horn

Psammodius oregonensis Cartwright

FIGURES 9, 37, 38, 50, 66, 72, 87

MATERIAL EXAMINED: Forty-four third-stage larva collected in sand dunes under grass roots at Waldport, Oreg. Four were collected on Jan. 29, 1955; 10 on Mar. 29, 1955; 20 on June 16, 1955; and 10 on Mar. 22, 1957.

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.79–0.86 mm. Cranium whitish yellow, surface smooth. Five or six dorsoepicranial setae and two microsensillae on each side. Each antennal base with two long setae and two short setae exterolaterally and one long seta dorsally.

Epipharynx slightly broader than long. Protophoba bistichous on left and monostichous on right with 12–14 microsensillae. Crepide subcircular.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with eight short setae, each scutum with six long setae and 12 short setae on each side, and each scutellum with 12 short setae.

Raster with teges of 36–44 hamate setae scattered irregularly on the venter of 10th abdominal segment, five or six long slender setae on either side.

Psammodius hydropicus Horn

MATERIAL EXAMINED: One third-stage larva collected in field, with adults, at Folly Beach, S.C., June 14, 1941, by O. L. Cartwright (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.66 mm. Cranium light yellow, surface smooth except for two depressions on each side on the frons. Five or six dorsoepicranial setae and two microsensillae on each side. Each antennal base with two long setae and one short seta exterolaterally and one long seta dorsally.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 12 microsensillae.

Dorsal annulets of abdominal segments 1–5 with setation as follows; each prescutum with eight short setae, each scutum with five long setae and 11 short setae on each side, and each scutellum with 12 short setae. Raster with teges of 33 hamate setae curved at their distal ends.

Genus *Pleurophorus* Mulsant

Larvae of genus *Pleurophorus* may be characterized as follows: Each antennal base with two long setae and a short seta extero-

laterally and one long seta dorsally. Clypeus not distinctly divided into preclypeus and postclypeus. Lacinia dorsally with a row of four or five long setae near the mesal edge and one short seta posteriorly. Galea ventrally with a long seta and two short setae. Spiracular concavity facing ventrally. Each abdominal spiracle-bearing area with two setae ventrally and one seta dorsally. Lower anal lobe divided into two sublobes placed adjacent to each other.

Key to known larvae of *Pleurophorus*

Second and third antennal segments subequal, first long; laeotorma small as compared to dexiotorma in size; each mandible dorsally with a single seta.
caesus (Creutzer)

First and third antennal segments subequal, second short; laeotorma and dexiotorma more or less similar in size; each mandible dorsally with two setae.
longulus Cartwright

Pleurophorus caesus (Creutzer)

FIGURES 6, 22, 36, 64, 73, 89

MATERIAL EXAMINED: Two third-stage larvae collected at San Francisco, Calif., June 11, 1934, by P. C. Ting and J. B. Stinweden (POR); one third-stage larva, associated with two adults and a pupa, collected in potato hills at Wapota, Wash., July 14, 1941, by L. J. Lipovsky (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.79–0.81 mm. Cranium brownish yellow, surface smooth except for two depressions on each side on the frons. Four dorsoepicranial setae and one microsensilla on each side. Second and third antennal segments subequal, first longer than second or third.

Epipharynx with protophoba tristichous or bistichous on the left and monostichous on right; protophoba with 12–13 microsensillae. Crepide small, subcircular, and with two microsensillae. Tormae asymmetrical; dexiotorma produced cephalad and caudad; laeotorma smaller than dexiotorma.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with 10 short setae, each scutum with three long setae and nine short setae on each side, and each scutellum with 12 short setae.

Raster with teges of 28–31 hamate setae scattered irregularly on the venter of 10th abdominal segment, three or four long setae on either side.

Pleurophorus longulus Cartwright

FIGURES 21, 51, 65

MATERIAL EXAMINED: One third-stage larva associated with a pupa and adults, collected in soil samples from experimental plots at Gulf-

port, Miss., Jan. 14, 1943, by R. B. Swain (USNM); four third-stage larvae collected on dog fennel at Orville, Ala., May 12, 1943, by A. V. Smith (USNM).

DESCRIPTION: Maximum width of head capsule of third-stage larva 0.59–0.63 mm. Cranium light yellow, surface smooth. Three dorsoepicranial setae and two microsensillae on each side. First and third antennal segments subequal, second shorter than first and third.

Epipharynx with protophoba bistichous on left and monostichous on right; protophoba with 11–13 microsensillae. Crepide small, subcircular, with two microsensillae on it and two on either side of it. Epitorma asymmetrical, flattened apically and bent toward laeophoba. Tormae similar in size and shape, both tormae produced cephalad and caudad.

Dorsal annulets of abdominal segments 1–5 with setation as follows: each prescutum with six short setae, each scutum with three long setae and four short setae on each side, and each scutellum with eight short setae.

Raster with teges of 18–22 hamate setae scattered irregularly on the venter of 10th abdominal segment, setae curved at their distal ends.

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SYMBOLS ON FIGURES 1–89

A—Antenna
AA—Seta of anterior frontal angle
AC—Acia
ACP—Acanthoparia
ACR—Acroparia
AFS—Anterior frontal seta
BR—Brustia
CAR—Cardo
CL—Claw
CLP—Clypeus
COX—Coxa
CR—Crepis
DES—Dorsoepicranial setae
DPH—Dexiophoba
DX—Dexiotorma
EFS—Exterior frontal setae
ET—Epitorma
FEM—Femur
FS—Frontal suture
G—Galea
GL—Glossa
GP—Gymnoparia
H—Hyptomerum
L—Labium
LA—Lacinia
LAL—Lower anal lobe
LP—Labial palpus
LPH—Laeophoba
LT—Laeotorma
M—Molar area
MP—Maxillary palpus
MPH—Mesophoba
MS—Macrosensilla
O—Oncylus
PC—Preclypeus
PF—Palpifer
PFS—Posterior frontal seta
PLA—Pladium
PPH—Protophoba
PSC—Postclypeus
S1–4—Scissorial teeth
SE—Sensory organ
SP—Sensory pegs
SPR—Spiracle
ST—Maxillary stridulatory area
3SEG—Third segment
T—Teges
TRO—Trochanter
TTS—Tibiotarsus
UAL—Upper anal lobe

Explanation of Figures

Figures 1–11.—Heads: 1, *Ataenius saxatilis* Cartwright; 2, *Aegialia blanchardi* Horn; 3, *Aphodius erraticus* (Linnaeus); 4, *Euparia castanea* Serville; 5, *Aphodius fimetarius* (Linnaeus); 6, *Pleurophorus caesus* (Creutzer); 7, *Saprosites pygmaeus* Harold; 8, *Ataenius* sp. (*strigatus* group); 9, *Psammodius oregonensis* Cartwright; 10, *Oxyomus silvestris* (Scopoli); 11, *Aphotaenius carolinus* (Van Dyke).

Figures 12–31.—12–15, Third and fourth antennal segments: 12, *Aphodius granarius* (Linnaeus); 13, *Oxyomus silvestris* (Scopoli); 14, *Aphodius fimetarius* (Linnaeus); 15, *A. troglodytes* Hubbard. 16–22, 27, Antenna: 16, *Aphodius fossor* (Linnaeus); 17, same, distal portion; 18, *Aphotaenius carolinus* (Van Dyke); 19, *Ataenius saxatilis* Cartwright, distal portion; 20, *Euparia castanea* Serville; 21, *Pleurophorus longulus* Cartwright; 22, *P. caesus* (Creutzer); 27, *Ataenius saxatilis* Cartwright. 23–26, 28–30, Dorsal view of left mandible: 23, *Aphodius granarius* (Linnaeus); 24, *Euparia castanea* Serville; 25, *Aegialia lacustris* LeConte; 26, *Oxyomus silvestris* (Scopoli); 28, *Aphodius fimetarius* (Linnaeus); 29, *A. erraticus* (Linnaeus); 30, *A. sparsus* LeConte. 31, *Euparia castanea* Serville, dorsal view of right mandible.

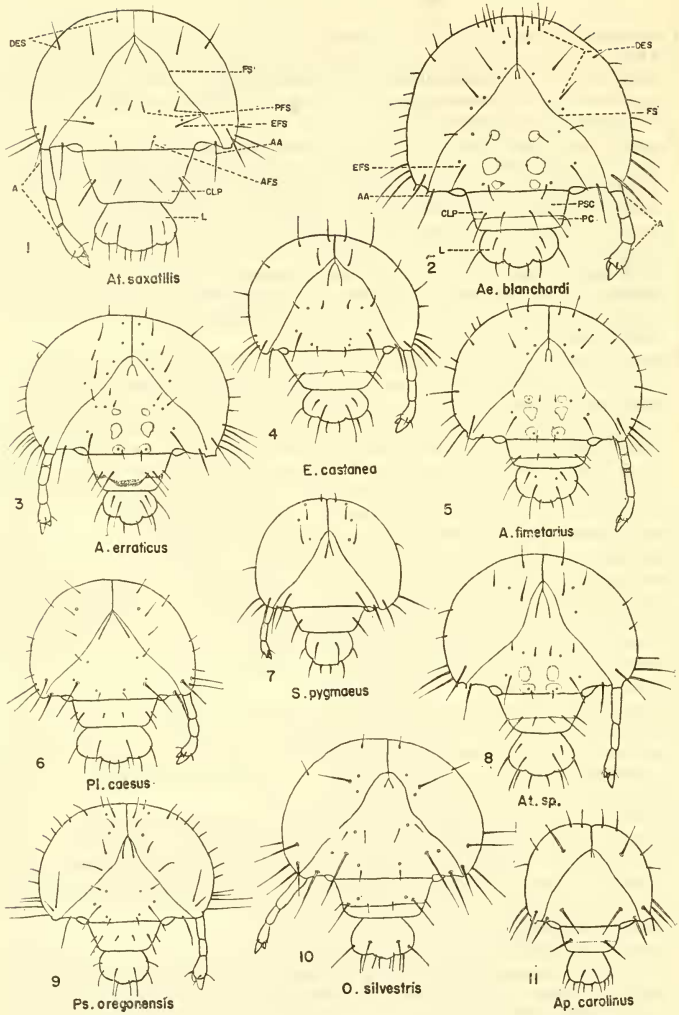
Figures 32–46.—32–37, Left mandible (all views dorsal except 35): 32, *Ataenius saxatilis* Cartwright; 33, *Ataenius* sp. (*strigatus* group); 34, *Aphotaenius carolinus* (Van Dyke); 35, same, ventral view; 36, *Pleurophorus caesus* (Creutzer); 37, *Psammodius oregonensis* Cartwright. 38, Same, right mandible, dorsal view. 39, 40, Left maxilla, labium, and hypopharynx, dorsal view: 39, *Aegialia blanchardi* Horn; 40, *Oxyomus silvestris* (Scopoli). 41, *Aphodius erraticus* (Linnaeus), left maxilla, dorsal view. 42,43, *A. fimetarius* (Linnaeus), dorsal views: 42, left maxilla; 43, labium and hypopharynx. 44,45, *Euparia castanea* Serville, dorsal views: 44, left maxilla; 45, labium and hypopharynx. 46, *Saprosites pygmaeus* Harold, left maxilla, labium, and hypopharynx, dorsal view.

Figures 47–56.—47,48, Left maxilla, labium and hypopharynx, dorsal view: 47, *Aphotaenius carolinus* (Van Dyke); 48, *Ataenius saxatilis* Cartwright. 49, *A. ovatulus* Horn, left maxilla, dorsal view. 50, *Psammodius oregonensis* Cartwright, left maxilla, labium, and hypopharynx, dorsal view. 51, *Pleurophorus longulus* Cartwright, left maxilla, dorsal view. 52–56, Epipharynx: 52, *Aphodius fimetarius* (Linnaeus); 53, *Aegialia blanchardi* Horn; 54, *Aphodius stercorosus* Melsheimer; 55, *Aphodius haemorrhoidalis* (Linnaeus); 56, *A. sparsus* LeConte.

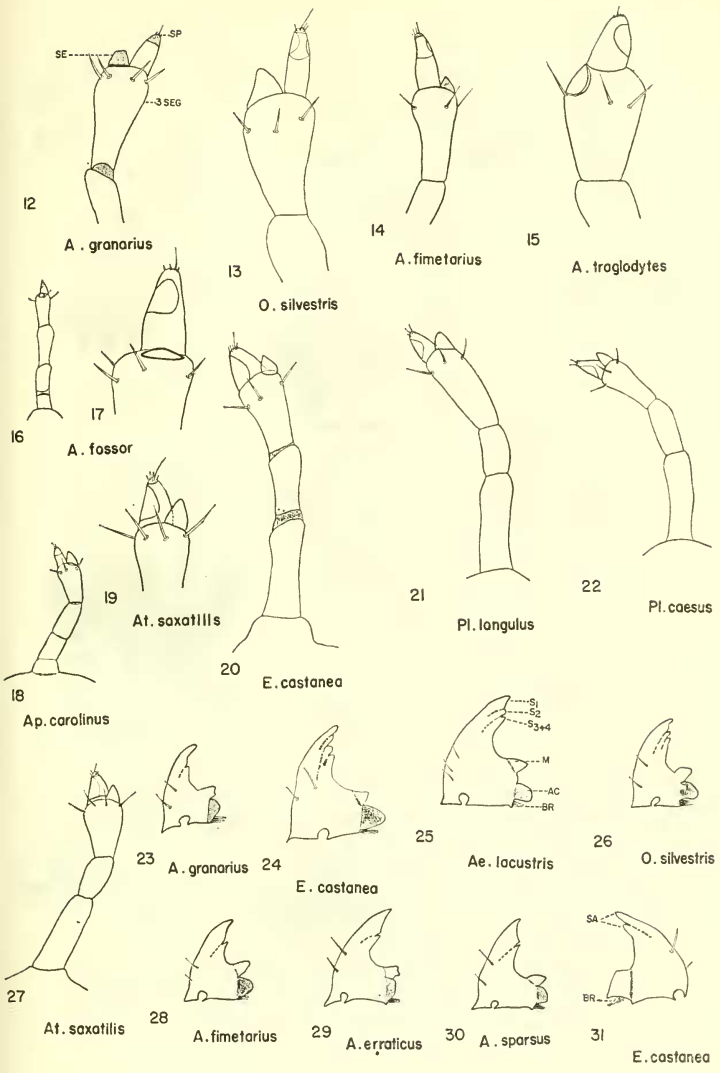
Figures 57–66.—Epipharynx: 57, *Aphotaenius carolinus* (Van Dyke); 58, *Ataenius saxatilis* Cartwright; 59, *Ataenius* sp. (*strigatus* group); 60, *Oxyomus silvestris* (Scopoli); 61, *Euparia castanea* Serville; 62, *Saprosites pygmaeus* Harold; 63, *Aphodius lividus* (Olivier); 64, *Pleurophorus caesus* (Creutzer); 65, *P. longulus* Cartwright; 66, *Psammodius oregonensis* Cartwright.

Figures 67–78.—Venter of 10th abdominal segment: 67, *Aphodius prodromus* Brahm; 68, *Saprosites pygmaeus* Harold; 69, *Aphodius pardalis* LeConte; 70, *Aegialia blanchardi* Horn; 71, *Oxyomus silvestris* (Scopoli); 72, *Psammodius oregonensis* Cartwright; 73, *Pleurophorus caesus* (Creutzer); 74, *Aphotaenius carolinus* (Van Dyke); 75, *Ataenius* sp. (*strigatus* group); 76, *Aphodius fimetarius* Linnaeus; 77, *A. vittatus* Say; 78, *Ataenius saxatilis* Cartwright.

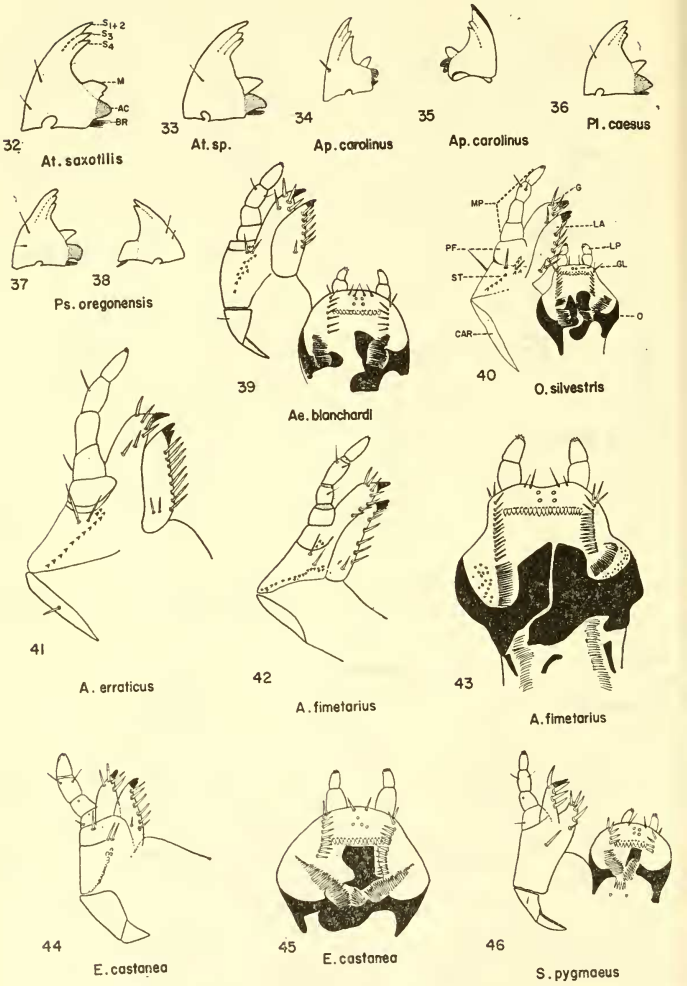
Figures 79–89.—79–81,83, Abdominal segments 7–10, lateral view: 79, *Oxyomus silvestris* (Scopoli); 80, *Ataenius saxatilis* Cartwright; 81, *A. strigicauda* Bates; 83, *Saprosites pygmaeus* Harold. 82, *Aphodius fimetarius* (Linnaeus), left metathoracic leg, lateral view. 85,86, Caudal view of last abdominal segment: 85, *Aphodius erraticus* (Linnaeus); 86, *Aegialia lacustris* LeConte. 84,87–89, Caudal view of last abdominal segment showing only the lower anal lobe: 84, *Ataenius saxatilis* Cartwright; 87, *Psammodius oregonensis* Cartwright; 88, *Saprosites pygmaeus* Harold; 89, *Pleurophorus* caesus (Creutzer).



Figures 1–11.—Explanation on page 87.

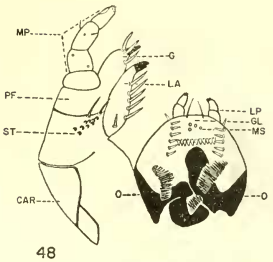


Figures 12–31.—Explanation on page 87.

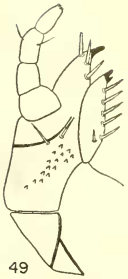


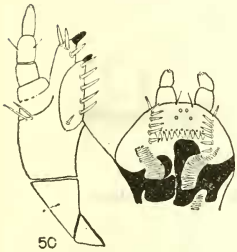
Figures 32–46.—Explanation on page 87.


47
Ap. carolinus

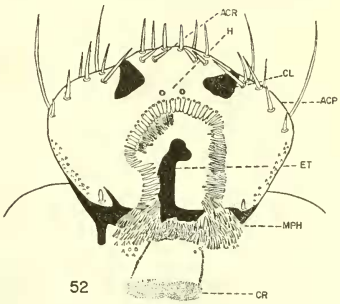


48
At. saxatilis

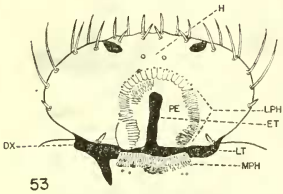

49
At. ovatulus


50
Ps. oregonensis

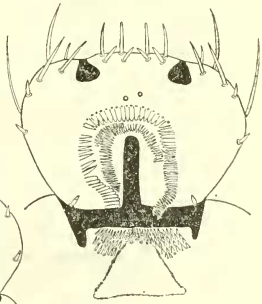

51
Pl. longulus



52
A. fimetarius



53
Ae. blanchardi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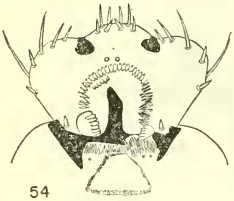
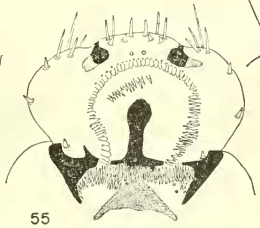
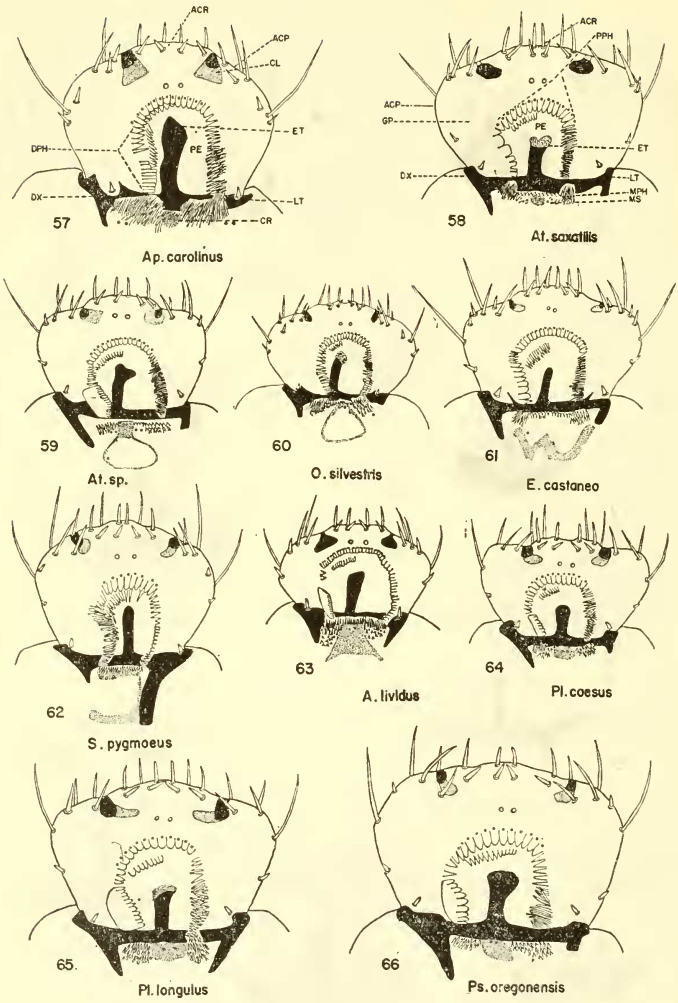
A. sporsus

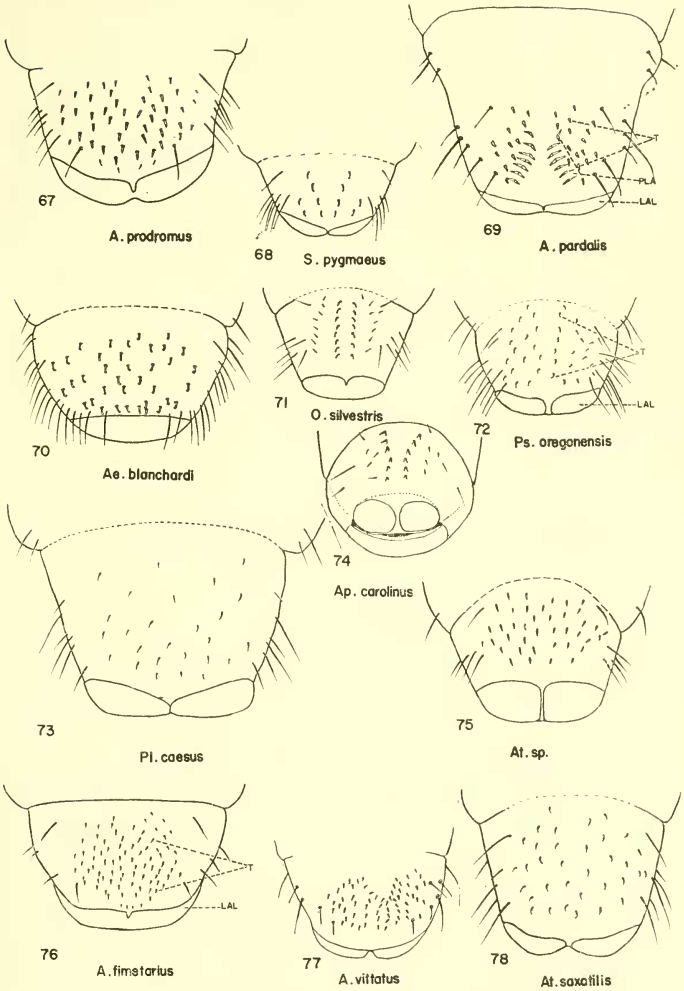

54
A. stercorosus


55
A. haemorrhoidalis

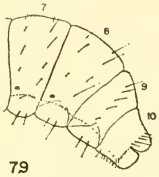
Figures 47–56.—Explanation on page 87.



Figures 57–66.—Explanation on page 87.

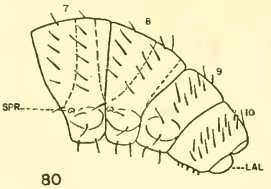


Figures 67–78.—Explanation on page 87.



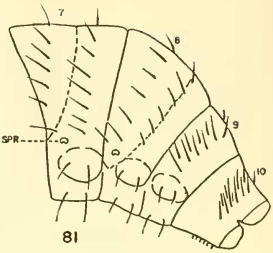
79

O. silvestris



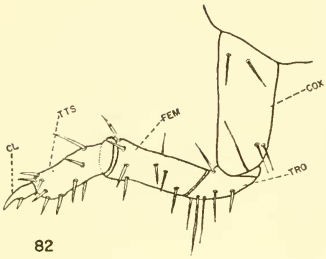
80

At. saxatilis



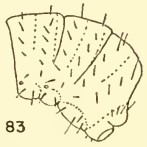
81

At. strigicauda



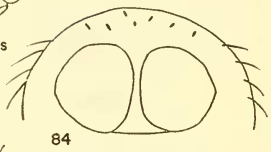
82

A. fimetarius



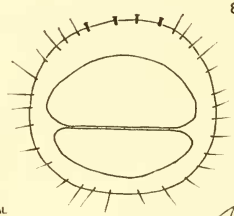
83

S. pygmaeus



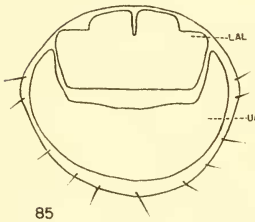
84

At. saxatilis



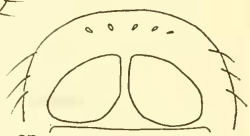
86

Ae. lacustris



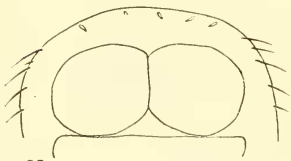
85

A. erraticus



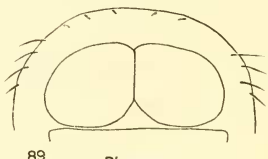
87

Ps. oreganensis



88

S. pygmaeus



89

Pl. caesus

Figures 79–89.—Explanation on page 87.

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